

S P E C I F I C A T I O N

Attorney Docket No. 10628.00096

[01] TO ALL WHOM IT MAY CONCERN:

[02] Be it known that **Randall J. Ploeger**, a citizen of the United States and a resident of Clarinda, Iowa; **Louis J. Garcia**, a citizen of the United States and a resident of Gary, Indiana; and **George P. Juliano** (deceased), by and through his wife and sole heir and Executrix, Martha Juliano, a citizen of the United States and a resident of Pittsburgh, Pennsylvania, have invented certain new and useful improvements in a

DUAL PISTON DISC BRAKE CALIPER COMPRESSOR

of which the following is a specification.

CROSS REFERENCE TO RELATED APPLICATIONS

- [03] This is a utility application based upon and incorporating by reference provisional application Serial No. 60/533,898 entitled "Dual Piston Disc Brake Caliper Compressor" filed January 2, 2004 for which priority is claimed, and utility application Serial No. 10/339,091 filed January 9, 2003 entitled "Disc Brake Pad Spreading Tool" incorporated herewith by reference and for which priority is claimed.

BACKGROUND OF THE INVENTION

- [04] In a principal aspect the present invention relates to a tool for compressing the caliper pistons of a vehicle, dual piston disc brake assembly so that the disc pads may be removed and replaced. The invention thus comprises a manually actuated dual piston disc pad spreading tool.
- [05] In the repair of vehicles and, for example, with respect to the repair of vehicle braking systems, many special tools are desirable. Disc brakes thus may require special tools to facilitate repair. Disc brakes typically include a caliper housing which is mounted adjacent a wheel. The housing includes opposed disc pads which are piston driven toward one another for clamping a rotating disc associated with a rotating wheel of the vehicle to brake or stop the vehicle. From time to time, it is necessary to replace the pads due to the fact that they wear from frictional contact with the rotating disc. In such circumstances, the caliper housing is typically removed from the wheel assembly of the vehicle, and the disc pads mounted in the housing are caused to be spread apart by retracting the pad driving piston or pistons into the caliper housing. The pads which have been spread apart may then be easily removed and replaced. The caliper housing may then be replaced in the wheel assembly and positioned for engagement with the brake disc.
- [06] Heretofore, applicant's assignee has made available in the marketplace a disc brake pad spreader tool, Lisle Product Model No. 24400. The Model No. 24400 disc brake pad spreader comprises a plate having a threaded rod through the center of the plate with a plunger mounted on the end of the rod. The plunger and plate are positioned between the opposed pads of a disc brake caliper and are separated by rotating the threaded bolt or rod which connects the plate and plunger to thereby separate the pads.
- [07] More recently, applicant's assignee introduced an improved brake pad spreader tool, particularly designed for use with single piston disc brake constructions. The product, identified as Model No. 24300, is the subject matter of a separate patent application; U.S. Patent Application Serial No. 10/339,091, filed January 10, 2003, entitled Disc Brake Pad Spreading Tool, which is incorporated herewith by reference.

- [08] The described tools work quite well and have been widely accepted by auto mechanics responsible for the repair of disc brakes. A difficulty occurs with such tool designs; however, since the tools are not especially useful for repair of a dual piston disc brake assembly. This results because two separate, parallel drive, pistons mounted on the caliper housing are associated with such an assembly. That is, the pistons are mounted on a frame or housing wherein placement of a drive rod of the type in the above described tools is not possible because of the particular construction of the housing. The housing includes a center foot which interferes with positioning of the drive rod associated with the described tools.
- [09] Thus, there has developed a need for an improved disc brake pad spreading tool which can effectively spread the pads mounted in the caliper housing for a dual piston disc brake and which can also compress simultaneously both of the pistons associated with the caliper housing.

SUMMARY OF THE INVENTION

- [10] Briefly, the present invention is a tool for spreading the brake pads associated with a dual piston disc brake caliper. The tool includes a bracket assembly mounted on the end of a slidable rod which, in turn, is mounted in a hand actuated rod advancement mechanism. The rod advancement mechanism further includes a plate positioned in opposed relationship to the bracket assembly. The plate may be fitted against one side of a dual piston caliper brake pad frame, and the bracket assembly may then be driven into engagement with opposed pads and pistons opposite the frame side thereby separating the disc pads and/or disc pad mounts and also simultaneously compressing the dual brake pistons into their cylinders.
- [11] The mechanism for advancing the rod upon which the plunger is mounted comprises a fixed handle and a pivotal handle. The pivotal handle engages a feed dog that drives the rod incrementally forward with each reciprocal movement of the pivotal handle. A rod brake or pawl comprised of a second pivotal plate is provided for engaging the drive rod and precluding backwards movement of the rod. In other words, as the rod is moved forward in incremental steps, the rod braking plate maintains the rod in a desired or fixed advanced position.
- [12] With the combination of the invention, an improved mechanical advantage is achieved for driving the pads of the dual piston disc brake apart and for driving the pistons associated with the disc brake caliper into the housing or frame. In this manner, new pads may be placed upon pad mounts in the caliper so as to permit the caliper to be reassembled with the disc brake assembly.
- [13] Thus, it is an object of the invention to provide a dual piston disc brake pad and piston compressing device which provides for improved mechanical advantage and ease of use.
- [14] It is a further object of the invention to provide a dual piston disc brake pad spreading device which is easy to use, economical, rugged, and easy to fit and position during repair of a disc brake assembly.

- [15] Yet another object of the invention is to provide a tool for spreading dual piston disc brake pads and for compressing pistons of a disc brake assembly wherein the tool is comprised of a pair of handles, one of which is reciprocal with respect to the other to effect separation of a bracket assembly and plate wherein the bracket assembly and the plate are respectively engaged with opposed, generally parallel spaced disc brake pads or disc brake pad mounting plates.
- [16] Yet a further object of the invention is to provide an improved tool for spreading dual piston disc brake pads during repair of a disc brake assembly.
- [17] These and other objects, advantages and features of the invention will be set forth in the detailed description which follows.

BRIEF DESCRIPTION OF THE DRAWING

- [18] In the detailed description which follows, reference will be made to the drawing comprised of the following figures:
- [19] **Figure 1** is a side elevation of the tool of the invention;
- [20] **Figure 2** is an end view of the tool of Figure 1 taken along the line 2--2 of Figure 1;
- [21] **Figure 3** is an exploded isometric view of the tool of Figure 1;
- [22] **Figure 4** is an isometric view illustrating the tool of Figure 1;
- [23] **Figure 5** is an isometric view illustrating the use of the tool of Figure 1; and
- [24] **Figure 6** is a cross sectional view of the retention not used in the tool of Figure 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

- [25] Referring to the figures, the tool of the invention comprises a body or frame member 10. The frame member 10 includes a depending fixed handle 12 with an upper frame element 14 comprising a first or forward frame section 16 and a second or rear frame section 20. The frame sections 16 and 20 are generally parallel to one another and spaced to define a window 22. A reinforcing rib 24 with a mounting projection 26 is provided on the top of the frame element 14. The rear frame section 20 includes a throughbore 28 into which a cylindrical hollow fitting 30 with throughbore 31 is inserted. The front frame section 16 also includes a throughbore 32 into which a cylindrical flanged nut 34 having external threads, an internal axial throughbore 36 with axial counterbore 38 on the inside end and an axial counterbore 40 on the outside end being provided. The flanged nut 34 is threaded into the front frame section 16 and holds a U-shaped plate 42 onto the front frame section 16. The plate 42 is a U-shaped plate having a leg 43 retained by nut 34 on frame 16, an axial run 45 and a depending leg 47 parallel to and spaced forwardly from leg 43. Nut 34 is fully threaded as depicted to assure adequate strength and holding ability.
- [26] The flanged nut 34 and, more particularly the throughbore 36 as well as the throughbore 31 of the fitting 30 receive an elongate rod 50 defining a longitudinal axis 51. Elongate rod 50 comprises an end 52 with a plunger 52A and a coil spring 52B and a straight section fitting through or projecting respectively through the bores 31, 36 of the fitting 30 and nut 34. A bracket assembly 54 is attached to the outer end 56 of the rod 50. The rod 50 is thus slidable through the frame element 14 with the sliding movement controlled by means of a biased feed dog 60 and a biased locking bar, plate or pawl 62 in combination with a pivotal handle 64 mounted on the frame member 10 by means of a pivot pin 66. The plunger 52A and spring 52B limit movement of rod 50 and also prevent rod 50 from binding and locking in position on plate 62.
- [27] The pivotal handle 64 includes a lever arm extension 67 which, when pivoted on pin 66, engages with a lower side or end 61 of the dog 60 and advances the dog 60 as well as the rod 50

against the biasing force of a coil spring 68 mounted on the rod 50 intermediate the dog 60 and a land 70 in the counterbore 38. Counterbore 38 functions to maintain the spring 68 appropriately guided in alignment for biasing of the dog 60.

[28] The tool further includes a locking bar 62 biased by a spring member 80 about a pivot axis 82 on the reinforcing rib 24. The locking bar 62 includes a throughpassage into which the rod 50 fits, and when the biasing spring 80 biases the locking bar 62 in the manner depicted in Figure 1 the edges of the throughpassage engage the rod 50, precluding the rod 50 from moving in the direction of the arrow or to the right as depicted in Figure 1. The rod 50 may, however, be manually moved in the opposite direction or to the left as depicted in Figure 1. The dog lever extension arm 67 of handle 64 provides a mechanical advantage when advancing the rod 50 to the left. In other words, the dog 60 includes a throughpassage which is oversized relative to the diameter of the rod 50. Driving the dog 60 forward by means of actuation of the pivotal handle 64 causes the dog 60 to become canted slightly. It will thus engage the rod 50 and drive the rod 50 to the left as illustrated in Figure 1. The dog 60 will return to its uncanted, initial position upon release of the handle 64 thereby enabling the spring 68 to transport dog 60 to the right and position the dog 60 for additional incremental movement of the rod 50. In this manner, the end 56 of the rod 50 can be driven so as to be further spaced from the backing plate 42.

[29] The bracket assembly 54 comprises a first plate 55 attached to the distal forward end 56 of the rod 50. The plate 55 includes opposite ends 57, 59 from which axially extending bracket frame members or pins 61, 63 extend generally parallel to the axis 51. The opposite ends of the pins or extensions 61, 63 are attached to a second arcuate, planar plate 65 which is generally parallel to and spaced from the first plate 55. Plate 65 is arcuate with the center of the arc extending toward the center of the disc as depicted in Figure 5. This enables alignment of plate 65 with the associated dual pistons of the brake assembly. The bracket assembly 54 thus moves in response to movement of the rod 50. The leg 47 which depends from the run 45 of the plate 42 fits between the rods 61, 63 and the plates 55, 65. Thus, the bracket assembly 54 may move in response to movement of the rod 50 while the plate 42 including leg 47 remains in a fixed position.

- [30] By positioning leg 47 of the plate 42 against one side of a pad mount leg 75 of the caliper housing 77 of a disc brake assembly, such as depicted in Figure 5, and the plate or cross member 55 against the opposite side of leg 75, one may effect spreading of the pads. That is, the leg 47 and cross member 55 will be compressed onto leg 75 and the bracket assembly 54 will be effectively extended as rod 50 is axially extended to thereby compress dual pistons 72A, 72B in the frame 77. Once the pads are spread, (i.e. the pistons 72A, 72B compressed), the brake pads may be easily removed from the caliper housing since the tool may be removed. Thus, the spreading operation causes dual brake pistons 72A, 72B, which drive the pads toward each other, to be retracted into the cylinders where they stay since there is no fluid driving force imparted through the cylinders during repair. The pads may thus be removed, replaced and will maintain the spread distance one from the other until the caliper is replaced within the brake assembly and attached to the brake line system. By pre-spreading the pads in the manner described, one can be assured that the caliper can be positioned so that the pads will fit over and on opposite sides of the disc of the disc brake assembly.
- [31] The described construction provides a mechanical benefit in that the handles 64 and 12, when used in combination with the other elements of the apparatus, enable the operator to provide a significant mechanical advantage due to the long extension of the typical handle 64 relative to the extension lever arm 67. The utilization of a locking dog 60 in combination with a locking plate 62 and associated biasing springs arranged in the manner depicted enables movement of the rod 50 to spread the pad spreading elements and maintain that spread. Release of the element from a spread position is effected by pressing on the brake lever or locking plate 62 and moving it clockwise in the direction shown by the arrow in Figure 1 against the force of the biasing spring 80. The rod 50 is then free to move.
- [32] Importantly, as shown in Figure 6, the flanged nut 34 includes counterbores 38 and 40 at the opposite ends thereof. The counterbores are greater in diametrical dimension than the bore 36 for the rod 50. This enables the inside bore 38 to act as a guide for a dog biasing spring 68. The outside counterbore 40 enables the plunger to be positioned more closely to the plate 42 inasmuch as a mounting nut 55A for the bracket assembly 54 may fit within the recess defined

by the counterbore 40. Thus, the pad engaging elements associated with the described tool will have a more universal application inasmuch as they can be used with calipers having a wide variety of caliper sizes.

- [33] Variations of the construction may be adopted. For example, the particular arrangement of the handle may be reversed with the back handle 12, which is a fixed handle, being made to be pivotal and the forward handle 64 being made to be fixed. The particular arrangement of the locking bar 62 may also be altered. The construction of bracket assembly 54 may be varied as may that of plate 42. Thus, while there has been set forth a preferred embodiment of the invention, it is to be understood that the invention is limited only by the following claims and equivalents thereof.